232 J-1

# ENGINEERING NEWS

AND

# AMERICAN CONTRACT JOURNAL.

## VOLUME XI.

## JANUARY TO JULY,

## 1884.

ENGINEERING NEWS PUBLISHING CO.,

NEW YORK.

GENERAL LIBRARY OF THE UNIVERSITY OF MICHIGAN

# INDEX TO VOLUME XI.


AFRICAN Sea. The Interior (*Illustrated*)... 146
Air Compressor. The Rand... 92
Adjustment of Grades to Curves... 116
Aluminum for Tapes... 58, 70
Aluminum. Wonderful Discoveries in... 21
American Securities Abroad... 280
An Astonished Inspector... 220
Apparatus of Gen. Ibanez. The Measurement of the Aarberg Base Line in Switzerland, and the (*Illustrated*)... 133
Appliances for Fire Protection. Special... 203
Aqueduct Co. Haverhill, Mass... 177
Aqueduct Co. Mansfield Pond. Mass... 94
Aqueducts on High Embankments (*Illustrated*)... 212
Aqueducts. On the Cleaning of (*Illustrated*)... 204
Aqueduct. New Croton... 18, 30, 94, 127, 177, 203 305
Artesian Wells at Colorado Springs, 47; Denver, 105; Greeley, 130; and Montrose, Colo. 130; Key East, N. J. 178; Pittsfield, Mass. 71; Diana, Dak. 248; Fort Sully, Ark. 177; Philadelphia, Pa. 174; Lincoln, Neb. 205; New York City, 165; Portland, Dak. 234; Russell Kan. 118; So. Evanston, Ills. 241; Reward Given, 234; Joliet Ills. 104; Marysville Dak... 104
Arlberg Railway. Comparative Cost of Bridges on... 67
Armor Experiments in Cast Iron (*Illustrated*)... 213, 254
Armor under Fire. Behavior of... 270
Asphalte and Wood Pavements in London. Eng... 206
Asphaltum Pavements are Made, How... 76
Asphalt. The Antiquity of... 58

BALANCING, Profile Quantities (*Illustrated*)... 232
Bars and Plates. Test Pieces for... 97
Base line in Switzerland, etc. Measurement of the Aarberg (*Illustrated*)... 133
Bids. Abstract of... 29, 35, 144
for Bartholdi Statue Work... 119
Caissons... 208
City Hall Work Philada. Pa... 119
Cleaning N. Y. Streets... 119
Court House at Columbus O... 143
18th St. Denver Bridge... 96
Indiana College... 162
Insane Asylum at Evansville, Ind... 208
Mare Island Pumping Machinery and Caisson Gates... 83
Norfolk Va. Water Pipe... 59
Public Buildings at Quincy, Ills... 89
Pumping Machinery... 208
Street Paving in Atlanta, Ga... 119
Sidewalks for Court House etc. Cincinnati, O... 89
Stone and Brickwork at Frankfort Ky. 208
St. Lawrence Canal Void... 47
Water Tunnel. Minneapolis, Min... 131
Government Work... 111
Blue Copy Process. New... 140
Board of Health, Md. State... 221
Board of Public Works for Boston... 47
Boilers. Construction of Steam... 215
Boiler Explosions in England... 219
Boiler. The Honigmann-Soda... 79
Boiler. The New Root Wrought-iron Sectional (*Illustrated*)... 86
Book-perfecting Printing Machine... 90
Boston. Board of Public Works for... 47
Bridge Accidents Come, How... 132
and Tunnel in 1883, Earnings of St. Louis... 143
and Tunnel Notes... 248
at Davenport, Ia. New... 96
at Havre de Grace, Md., B. & O... 230
at Nashville, Cumberland River... 179
Brooklyn's Interest in the East River... 19
Builder, Stonewall Jackson's... 22
Cantilever (*Illustrated*)... 34
Co. Bonds. Henderson... 132
Co. Chippewa River... 47
Co's. Incorporated. Virginia... 96
Co. Union... 127
Co. The Phoenix... 192, 216
Destroyed by Ohio Floods... 143
Extension. The Brooklyn... 155
First Anniversary of East River... 272
Housatonic River R. R... 83
Law... 132
Legal Question of Ottawa, Ills... 143
Letting. Logansport... 70
New London... 11
New Schuylkill River... 119
Notes... 167, 192, 222, 236, 263
Ottawa, Waddington and N. Y. R. R... 47
over the Rokugo on the Yokohama R. R., Japan. Foundations of a (*Illustrated*)... 76
over Penn. Canal. Lift (*Illustrated*)... 267
Project over the Hudson... 116
Removal, Beaver, Pa... 132
Seekonk River... 273 328
Specifications. Standard... 127
Tests. Indicated (*Illustrated*)... 92
The Atchafalaya... 43
The Brooklyn... 151
The First Cantilever... 10
The Havre de Grace, Md... 179
The Market St. Philadelphia... 23
The Monongahela (*Illustrated*)... 251, 265
The New Tay... 100
The Niagara Cantilever (*Illustated*)... 237, 305
The O. W. & N. Y. R. R... 155
The Storm King... 23, 47
The Traveller Used in the Erection of the Niagara Cantilever (*Illustrated*). 98
Bridge. Total Receipts of East River... 83
Bridges in Germany. Inspection and Testing of Iron Road... 319
Bridges on the Arlberg Railway. Comparative Cost of... 67
Bridges Registering Speed on... 125
Bridges Treatise on... 92
Bridges Tunnels, etc... 278
Bridging the Hudson River at New York. A Project for (*Illustrated*)... 89
Bridging Navigable Rivers... 155
Brandt Rock Drill. The (*Illustrated*)... 64
Brazil. The Outlook in... 296
Bricks of Chaldea. The... 61
Bronze. Gold colored... 149
Bronze made malleable with mercury... 47
Bronze the Tempering of... 97
Brush Craft. Up in... 299
Building and Pavements in Mexico... 266
Enlargement of Utica School... 47
for Piqua, O., Public... 106
in the World. Finest Office... 195
notes. New York... 271
ordinance for Minneapolis... 31
permits in 1883. Philadelphia... 11
premiums for plans for a Boston Public Library... 23
stones of Chicago. The... 1
Buildings, cost of U. S. Public... 144
Buildings in America. Raising and Moving (*Illustrated*)... 62
Buildings of New York. The Proposed. New... 6
Burning Strain on Revolving Wheels, (*Illustrated*)... 144
Bursting Strain on Revolving Wheels, (*Illustrated*)... 177

CANADA'S Enormous Debt... 192
Canadian News... 315
Canal. An Athenian... 154
Baltic and Black Sea Ship... 19
Baltic and North Sea... 48
Cape Cod... 71
Corinth (*Illustrated*)... 67, 279, 286
Iberean Peninsula... 292
Lake Borgne... 9
Manchester Ship... 272, 296
Nicaragua... 59, 85
Panama... 7, 67, 72, 97, 126, 162, 163, 211, 285, 286
Rideau... 155
Tay, (Ont.)... 98
Canals. Hydraulic Lifts for... 246
Cantilever Bridges (*Illustrated*)... 34
Cantilever Bridge, Niagara (*Illus.*)... 237
Cantilever Bridge. The First... 10
Cantilevers. What's in a Name? (*Illustrated*)... 275
Car-load. Change of Minimum... 119
Car. The Modern Horse... 57
Car-wheels. Ten Million... 235
Car-Wheels. Paper... 330
Cast Iron Wheels... 250
Causes of the Wall St. Difficulties... 299
Cement for Iron... 268
Cement in Bags and Bulk... 105
Chimney Construction... 124, 145, 307
Chlorate of Potash, as an Explosive... 90
Cisterns in the Air... 291
Clay *vs.* Iron Pipe for Sewer Connections... 297
Cleaning of Aqueducts, On the (*Illustrated*)... 204
Coal Consumption of Locomotives... 221
Coal Mines. Use of Lime Cartridges in... 71
Coal Output of Great Britain in 1883... 153
Coke Manufacture. Improvements in... 204
Collieries. Spontaneous Combustion in... 109
Columbia, N. Y. College Commencement... 301
Company. Ramapo Improvement... 191
Compass, A New... 16
Complimentary... 34
Composite Pavement... 149
Compressed Air for Street Cars... 180
Compressed Air. Gas *vs*... 43
Compressed Air Plant. The Washington Aqueduct Tunnel and its (*Illustrated*)... 75
Compressor. The Ingersoll Improved "Straight Line" Air (*Illustrated*)... 22
Concrete Buildings for Farms... 268
Concrete Water Pipe... 118, 267
Consulting Engineers... 187
Contract for Anoka, Minn., Bridge... 61
Cleaning Brooklyn Streets... 178
Filling Farm Pond, Boston... 36
Good Thunder Bridge... 143
Government Cartage in New York City... 17
Grading Tower City Road... 59
Hotel at Albuquerque... 72
Kansas City Streets... 35, 70, 156
Minnesota Prison... 72, 83
Philadelphia... 156
Phoenixville, A. Cuban... 215
Pier and Abutments of Rush Street Bridge, Chicago... 83
Saugus Tunnel... 35
Contracting in Philadelphia... 138
Contracting Miscellany, 167, 192, 221, 249, 249, 263, 278, 292, 318, 236, 330
Contractor held for Ransom, A... 90
Contractors, Canadian R. R... 73, 155
Contracts. Government... 320
Converting a Locomotive into a Steam Fire Engine... 47
Convict Labor on City Hall, Chicago... 83
Copying Drawings and Tracings, New Process... 128
Copying of Maps in France. Photo... 320
Cost of Cleaning some N. Y. Buildings... 150
Cost of G. T. R. Second Track... 154
Cost of Running a Train... 148
Court House. The Pittsburg... 47, 58
Curves, Adjustment of Grades to... 116
Curves, Problem in Compound (*Illustrated*)... 92, 116, 140, 152

DAM at Ansonia, Ct., destroyed... 153, 234
Dam at Brattleboro, Vt... 219
Dam at Lansing, Mich... 47
Dam The Quaker Bridge (*Illus.*) 171, 174, 189
Dean Bros., Indianapolis, Ind... 94, 142
Deane Steam Pump Co... 35
Diamond Drills and the Ventilation of Long Tunnels... 216
Debt of the U. S... 243
Deflections for Sub-chords, Finding 34, 58
Discoloration of Brick Walls... 21
Dismal Swamp of Virginia, The... 66
Dismissal of French Employés of the U. S. Architect's Office... 6
Ditch, A Big Colorado... 165
Ditch Companies, Colorado... 106
Dixon Crucible Co's Receiver... 140
Drafting Pads, Better... 82
Drainage, House (*Illustrated*)... 40, 49
Drainage, Toronto Main... 106
Dredgers and Dredging on the Tees... 158
Dredging Bucket, The Both... 174
Dredge Burned at Panama... 47
Dredge Used at Colon, Marine (*Illustrated*)... 163
Drills of the Arlberg Tunnel (*Illustrated*)... 25, 37
Drill, The Brandt Rock (*Illustrated*)... 64
Dynamite as a Well-Driver... 64

EARNINGS of St. Louis Bridge and Tunnel in 1883... 143
Earthwork Problem... 116, 140 152
Earthquake Results... 305
Electric Light and Power Co. Olmstead, Ill... 111
Underground Co., Globe... 156
Carbon in... 96
Dakota, Building by... 208
Co., Erie, Pa... 76
Fort Wayne, Ind... 119
Companys may Erect Poles in N. Y. City... 119
Co., Orange, N. J... 119
In Joliet, Ill... 96
Notes... 167
Lighting Bids in Philadelphia... 156
Lighting, Cost of... 220
Locomotive, Best Results of... 95
Motive Co., Chapman... 156
R. R. Brighton, Eng... 154
Charing Cross and Waterloo... 154
Railway, Danchell's... 38
Transportation Co., American... 95
Underground Co., The Chicago Sectional... 208
Electrical Exhibition, Philadelphia... 287
Electricity Fifty Years Hence, Work of... 156
Electricity, Gas *vs*... 43
Electricity in Boston, Cost of... 156
Elevation of Outer Rail... 84
Elevated Railway, New Orleans... 90
Elevated Road, Denver, Col... 18
Elevator, A Safe... 30, 150
Employés, Discharging Missouri Pacific 312
Engines at Saratoga, The Holly Gaskill Pumping (*Illustrated*)... 195
Engineers, Consulting... 187
Engineers, Mechanical... 259
Engineers, The Suppression Policy of American... 244
Engineering Colleges... 286, 304
Journal, New... 174
Journal, Ten Years of an... 186
Vanderbilt University, School of... 291
Photography. (*Illustrated*)... 293


## ENGINEERING ASSOCIATIONS.


American Institute of Electrical Engineers... 259
American Institute of Mining Engineers... 69, 90, 102, 186

AMERICAN SOCIETY OF CIVIL ENGINEERS.
Annual Meeting... 31
Annual Convention of 1884, (*Illustrated*) ... 227, 259, 272, 273, 286, 301, 308, 320, 321
Comparative Liability to, and Danger from, Conflagr tions in New York and London... 138
Election of Officers for 1884... 31
Election of Members... 10, 103, 114, 232, 303
Friction of Car Journals at Low Velocities... 303
High Chimney Construction... 114, 124
On the Temperature of Water at Various Depths in Lakes and Oceans... 205, 260
Permanent Transmitting Dynamometer... 260
Structural Steel... 103
Strength and Elasticity of Structural Steel... 232, 245
Strength of Wrought-iron Struts... 232
Some Recent Improvements in Testing Machines... 10
Transaction for November 1883... 90
Transactions for February... 274
Water Power with High Pressure... 103
American Society of Mechanical Engineers... 259, 287
American Water-works Association. The... 189, 201, 202
Association of Municipal Engineers... 301
Boston Society of Civil Engineers... 139
Civil Engineer's Club of Cleveland... 102, 139, 201
Connecticut Civil Engineers and Surveyors' Association... 31, 210, 300 322

ENGINEERS CLUB OF PHILADELPHIA.
Ancient and Curious Works upon Mining... 190
Aneroids in Leveling... 102
Action of Water in the Modern Turbine... 273
Atmospheric Elevator... 190
Crane, A Simple... 314
Crushing Strength of Ice... 127
Cushioned Pier and Rolling Trunnion Drawbridge... 217
Club House, New... 314
Determining the True Meridian... 127
Economical Form of Bridge Truss... 231
Effect of Sea-water on the Iron of Brandywine Shoal Lighthouse... 273
Exhaust Injector... 102
Formulæ for Switch Calculations... 190
Gun Foundry Notes... 232
Jones' Puppet Valve... 19
Loiseau's Inventions... 19, 80
Notes on Clamping Bolts... 19
Obstructed Water Pipe... 80
Ores, Central Panama... 314
Penna. Schuylkill Valley, R. R. Bridge, 218
Philadelphia True Meridian... 190
Pocahontas Mine Disaster... 217
Pope's Flying Pendent Lever Bridge... 273
Power's Disinfecting Tank... 190
Protractor, A New... 314
Quetil's Wire Truss Railway... 80
Rapid Transit in Cities... 273, 314
Reference Book, The... 218, 273
Removing Condemned Machinery by Dynamite... 273
Resilience of Steel... 71
Seamless Copper Tube... 190
Stake Tacks... 190
Steel and Iron R. R. Ties... 80
Stewart's Current Motor... 231
Survey, U. S. Coast and Geodetic... 314
Triangulation of Pennsylvania... 127
Waddell's Lateral System for Iron Pratt Truss Highway Bridges... 102
Engineers Society of Western Pennsylvania... 42, 114, 150
Institution of Civil Engineers... 18, 20, 258, 284, 304

LIVERPOOL ENGINEERING SOCIETY
Annual Meeting... 3
Election of Officers... 3
Application of Compressed Air to Mining... 66
Boy's Engine Power Meter... 129
Compressed Air in Connection with Sewerage Works... 162
Improvements in Air Compressors... 128
Improvements in Locomotive Engines... 218
Insulite Sealed Battery... 3
Modern Progress in Mine Engineering 3
Strength of Bronze Alloys... 129
Velometer, Universal Governors and Compound Attachments for Controlling Low-pressure Cylinders, The... 3
Mechanical Engineering Society, A... 30
Michigan Surveyors and Civil Engineers... 301
Missouri Surveyors and Civil Engineers. 300
New England Water Works Association... 288, 325
Ohio Surveyors and Civil Engineers... 82
Society Civil Engineers of Paris, The... 68

Errors in Levelling Long Distances... 116
Everglades, The Florida... 161
Exchange, N. Y. Produce... 273
Exhibition, California International... 30
Experiments in Cast-Iron Armor (*Illustrated*)... 213
Explosive, Chlorate of Potash as an... 90

FILLING Trestles... 304
Filtering the Water Supply... 154
Filtration of Water... 322
Fire Arms, Improvements in... 266
Fire Engines in Berlin... 305
Fire Hose Coupling, Uniform... 118
Fire Protection, Special Appliances for... 203
Fish Pond, A Queer... 276
Fishing Nets of Telegraph Wire... 18
Flood Notes... 87
Flood Remedy, An Ohio... 118
Floods, The Ohio River... 137, 163, 176, 218
Foundations of a Bridge over the Rokugo on the Yokohama R. R., Japan (*Illustrated*)... 76
Foundation of the Cleveland, O., Viaduct. 190
Fountains, Lexington's... 98
Free Pass Carries Damages, A... 207
Friction... 15
Frogs and switches... 224 247
Frogs, Wooden Blocks in... 335

GAS Company, Bucyrus O. Natural... 208
Co. Kansas City, Natural... 119
Companies, Natural... 248
*vs* Compressed Air... 43
*vs* Electricity... 43
*vs* Electric Light... 198
Fuel, Price of... 309
in Lafayette, Ind... 108
in Richmond Va. Cost of... 156
Investigation, Natural... 168

Gas Main, The Largest ... 178
Gas tight joint, A Flexible ... 178
Gas Light Co. Central Puebio, Colo. ... 96
Gauge, Imperial Standard Wire ... 101
Gauge, New Water ... 154
Gauge, Railroad Narrow ... 284
Gauge, Water Pressure ... 46
Gauging Casks, Rule for ... 42
Gelatine Sensitive Paper ... 92
Girders, Steel vs. Iron ... 322
Gould's Losses, Jay ... 292
Grades to Curves, Adjustment of ... 116
Graphic Methods in 1650 ... 42
Graphic Method of Balancing Profile Quantities ... 232
Gunpowder ... 157
Gun, The largest ... 232

HARBOR, Baltimore ... 78
Harbor, Trieste New ... 61
Health of Canadian Cities ... 301
Health of Cities ... 95
Holly Gaskill Pumping Engines at Saratoga, (*Illustrated*) ... 95
House Connections with Water Mains, Cost of making ... 105
House Drainage (*Illustrated*) ... 40
Hunting Cholera ... 175
Hydrant Service, Cost of ... 291
Hydrant, The (Poetical) ... 16
Hydraulics in Excavation ... 142
Hydraulic Lifts for Canals ... 246
Hydraulic Mining ... 61

IMPROVEMENTS at Buffalo ... 277
Improvement Co. Northwestern ... 180
Improvement of the Harlem River ... 24
Improvements, Toronto City ... 106
Increase of Error in Long Lines of Level ... 161
Index, Our ... 67
India Ink ... 157
Industrial Situation, The ... 77, 127, 188, 287 324
Instructions to Bidders in Philadelphia ... 165
Insurance Rates in St. Louis to be raised ... 94
Insurance Rates in Toronto, Increase of ... 82
Iron, Actual Cost of Making a Ton of ... 22
and Steel Permanent Way ... 281
Cross Ties on Railroads ... 388
in 1883, Production of Pig ... 23
Notes ... 77
Painting ... 61
Pipe for Sewer Connections, Clay vs. ... 297
Railway Ties in Germany (*Illustrated*) ... 111
Trade, The ... 125
Irrigation in Colorado ... 129, 211, 276 325
Irrigation Works in Italy ... 150

JERSEY City's Proposition to Furnish New York with Water ... 78
Jetty System, The ... 319
Judgment against Chicago, Sexton's ... 59
Judgment against the St. Louis Tunnel, Railroad Co. ... 35

KERITE Telegraph Cable ... 19

LABOR, Prices of ... 299
Land Grants, The ... 292
Lead Pencils, Making ... 148
Legal Decisions, Late ... 158
Leveling Long Distances, Errors in ... 116
Liability for Damages by Ditch Opening, A City's ... 47
"Liberty Enlighting the World," (*Illustrated*) ... 4
Lifts for Canals, Hydraulic ... 246
Light-house, New Eddystone (*Illustrated*) 181
Light Wanted, Some ... 181
Lime Cartridges in Coal Mines, Using ... 79
Locomotive in Penn. Heaviest ... 95
Locomotive, The Smallest ... 250
Long Trains ... 235


## LITERATURE.


A Manual of Useful Information and Tables Appertaining to the use of Wrought-Iron Passaic Rolling Mill Co. 45
Annual Report upon Improvement of Ohio Rivers and Harbors ... 19
Cassell's Family Magazine ... 233
Compound Steam Engine ... 80
Dean Bros. Steam Pump Works Catalogue ... 80
Dynamic Electricity ... 128
Foundations and Foundation Walls ... 233
Geological Survey of N. J ... 304
Haswell's Pocket-book ... 324
Hints on the Drainage and Sewerage of Dwellings ... 69
How to Make Photographs ... 128
How to Set Slope Stakes ... 69
Journal of the Association of Engineering Societies for June, 1883 ... 18, 262
New Statistical and Railroad Map of Mexico and the Northern Frontier ... 33
New System of Laying out Railway Turnouts Instantly, by Inspection from Tables ... 91
Patents on Inventions ... 80
Pencoyd Iron Works ... 19
Picturesque B. & O. ... 91, 233
Report of Board of Water Commissioners of Hartford, Ct. ... 289
Brooklyn Public Works ... 274
Ch. Eng. Phil. Water Dept. for 1883, Annual ... 260
City Eng. of Toronto ... 289
Committee on Boundary Line of Ohio and Penn ... 289
Com. State Board of Health, Sixth ... 174
Dallas, Tex., Annual ... 233
Ft. Wayne Water Works ... 313
Lowell Water Board ... 262
Metric Com. Boston Soc. C. E. ... 262
Public Water Board of Lynn, Mass., for 1883 ... 290
St. John, N. B., Water and Sewerage ... 313
Trustees of Water Works of Cleveland ... 289
Water Dept. of Cincinnati, O., for 1883 ... 289
Stephen Roper's Hand Books ... 115
Steel and Iron, Greenwood's ... 128
Surveyors' and Engineers' Field Book and Calculation Record, by J. B. Strawn. 45
Tables for Computing Equivalent Metric and Non-Metric Weights and Measures, by W. A. G. Emonts ... 19
Text-Book on the Method of Least Squares ... 304
The Air We Breathe, and Ventilation ... 128
Topographical Surveying, Specht's ... 128
Treatise on the Use of French Rock Asphalt (Seyssell) with Translation of a Paper read before the Society of Civil Engineers, By Leon Malo ... 19
Wrought-iron and Steel in Construction. 325

MAGNETIC Pole, Position of the Earth's ... 3
Mails to Mexico by Rail ... 278
Man in the Moon, The ... 268
Masonry, A Book on ... 344
Measurement of the Aarberg Base Line in Switzerland, etc. (*Illustrated*) ... 133
Mercury, Bronze made Malleable with ... 47
Meter Question, The Water ... 142
Method of Computing the Absolute Maximum Bending Moment on Stringers due to the Passage across them of a Series of Concentrated Moving Loads, A 56
Metric Conversion Tables ... 42, 46
Metric "Engineers Field Book" ... 140
Mexico, Her Public Works and People (*Illustrated*) ... 13
Mexican Reciprocity Treaty, The ... 78
Mexican Treatment of Railway robbers ... 306
Mines, Inadequate Supports in ... 190
Mine, Silver Monument ... 206
Mine Surveying ... 70
Mine Ventilation ... 222
Mining Company, The Pasadena Smelting and ... 206
Mining Copper Co. The Hecla ... 206
Mining, Hydraulic ... 61
Mining Notes ... 168, 178
Minneapolis Engineers Club, Election of Officers ... 55
Mississippi River Commission ... 3
Monument, "Newhall House Disaster" ... 119
Monument, Yorktown National ... 101
Motor, A New ... 152
Motor, The Triple Thermic ... 111
Mysteries of North American Lakes ... 298

NARROW Gauge Railways, Construction and Equipments of ... 123, 141
News from Panama ... 285
New York Board of Public Works, Report for 1883 ... 126
New York State Survey for 1883 ... 114
Notes on Gas and Electricity ... 220


## OBITUARY.


Avery, John ... 54
Babcock, Geo. Orville E. ... 288
Benham, Maj. Gen. Henry W. ... 288
Harris, Dr. Elisha ... 534
Humphreys, Brig. Gen. And. A. ... 9
Kneass, Strickland ... 33
Lovell, Gen Mansfield ... 288
McAlpine, Chas. LeGrand ... 33
Osborn John ... 9
Packer, Harry E ... 69
Phelps, Edward Haight ... 162
Pidgeon Francis ... 313
Shoemaker, S. M. ... 288
Smith, Prof. Chas. A ... 80
Totten, Col. George M ... 259
Weitzell, Maj. Gen. Godfrey ... 140

Obstruction of Cross Gutters to Surface Drainage ... 218, 232
Oregon, The Dry State of ... 165

PAINTING Iron ... 61
Paper Hanging ... 192
Papers to be Read at Buffalo Convention, Additional List ... 259, 273
Paris, The Dark Side of of ... 16
Party Walls ... 29
Passage of Upland Water Though a Tidal Estuary, On the ... 285
Pavements are Made, How Asphaltum ... 76
Pavement, Berlin Wooden ... 156
Pavements, Composite ... 149
Pavement in Minneapolis, Cedar Block ... 59
Pavements of Winnepeg ... 72
Paving in Baltimore, Prices of ... 206
Paving in E. Saginaw, Cost of ... 106, 143
Paving in Kansas City, Cost of ... 66, 221
Pencils, Making Lead ... 148


## PERSONALS.


ADAMS, Campbell W. City Engineer ... 140
Allen, appointed Supt., Frank F ... 9
Atwell Geo. P. died ... 45

BALDWIN, appointed Aqueduct Commissioner, C. C ... 20
Bakaki, Koltsi ... 259
Baucus, Geo. R ... 288
Bartels, Herman, Agt. Brandt Drill ... 115
Bartlett, Frank ... 313
Baxter, Gen. Hugh. H. died ... 91
Blackman, D. G. Supt ... 162
Brackett, Dexter ... 245
Biddulph, W. W. Electrical Engineer ... 288
Bell, Thos. J. Supt ... 259
Beuzenberg, G. H. Reappointed ... 201
Berndes Suicided, Adolph ... 55
Bentley, Henry A. City Engineer ... 202
Billin, Chas. E ... 201
Board of Examining Officers, Engineer Corps U. S. A ... 20
Bogart's Illness, Secretary ... 45
Bollman, Wendell, Bridge Builder, died ... 140
Boltons' Salary Increased, Jackson ... 102
Bowen, Col. E. S. Married ... 231
Boyton, the Swimmer, Capt. Paul ... 80
Boynton, Geo. H ... 313
Brown, Ch. Eng. Penn. R. R. Wm. H ... 91
Brown & Brown, Terre Haute ... 102
Broughton, Appointed Vice Pres. E ... 80
Buckman, City Surv'y'r, Napo, Cal. O. H. 9
Bullock's Survey Contract, M. W ... 44

CALVERT, Appointed Gen. Supt. T. E ... 9
Chapman Valve M'f'g Co. Removal ... 45
Chavanne to Map the Congo, Dr. Jos ... 55
Clarke, of Cleveland, Jas. Freeman died ... 45
Clarke, Supervisor, H. W ... 105
Cook, J. D. Toledo, O ... 201
Cornwell, C. L ... 313
Coombs, P. M. Elected ... 151, 162
Construction Co.'s Headquarters, Rio Grande ... 174
Cotton, Jos. P ... 272
Cromer, Walter died ... 206
Cutshaw's Salary Increased, W. E ... 102

DANA, Chas. A. and others ... 127
Danenhower, C. N. Chief Engineer ... 259
Davis, Chester B. Visits New York ... 188
Davis, of Springfield, Mass., E. C ... 9
Darrach, Chas. G. Resigned ... 288
Dingler's children, Death of Ch. Eng ... 151
Dwight, Jonathan, Chief Engineer ... 140

EDES, Inventor, Oliver died ... 102
Edbrooke & Burnham, Architects for Georgia Capitol ... 80
Eisenmann, John, Appointed Supt. of Parks ... 115
Ellis, Geo. A. Springfield, Mass ... 201
Elmore, Guy H ... 288

FISK, Col. Joseph died ... 272
Fletcher, Prof. Robt ... 272
Folsom, J. L. Master Mechanic ... 140
Fontaine, Prof. Edward died ... 45
Force, Jr., Cyrus G. City Engineer ... 245, 313
Fteley, A Executive Engineer ... 105

GARDNER, Elected Pres., G. Clinton ... 30
Gordon, Robt ... 313
Graham, John, City Engineer ... 259
Graham, Will ... 259
Gray, Sam'l M. Sailed for Europe ... 115
Guyot, Prof. Arnold Henry died ... 80

HAINES, Chief Engineer, H. S ... 102
Haller, John P. City Engineer ... 259
Harris, Elected Pres. N. P. R. R. Robt ... 45
Haugh, Jas. died ... 162
Haupt's Election, Gen. Hermann ... 9
Hawks, J. D. Chief Engineer ... 217
Hayden, W. B ... 259
Henning, M. E. Gus. C ... 115
Hering Rudolph ... 245
Hills, Presented Silver Pitcher, Francis L ... 55
Hoagland's Death, Hon. Pliny ... 43
Hoffman, Apptd. Ch. Eng., O. H ... 55

INGALLS, Seth H., Architect, Dead ... 130

JEWETT and Others, Hugh J ... 91
Johnson W. M., City Engineer ... 245
Jones Declines Re-election, J. W ... 9

KEENE, Jas. R., Speculator ... 272
Keim, Elected President, Geo. DeB ... 30
Knight, W. B. Re-elected ... 217
Knoche, G. Civil Engineer, Berlin ... 140
Knowles, Steam Pump Inventor, died Lucius J ... 105
Kuichling, Emil returned from Europe. 174

LAKE Geo. B. Appointment ... 127
Lake, Geo. B., died ... 217
Lambert's Appointment, C. C ... 9
Lay, George drowned ... 259
Laying Discharged Engineers, Gen. Manager ... 45
Laying Appointed, Gen. Man. J. D ... 9
Leah, Geo., drowned Oldest Engineer in the U. S ... 207
Livingston, Johnston Director ... 259
Lockett & Fuller, New Firm ... 30
Loring, Chief of Steam Engineering Bureau, Chas. H ... 20
Lowrie, H. C ... 30
Ludlow, Col. Wm. and a $50 bill ... 291
Lunt Clarence W., died ... 102

MASTIC Works, N. Y. Removal ... 217
Mathews, A. S. dead ... 80
Matsdaira, T. A. City Engineer ... 151
McCrary's Appointment, Judge Geo. W. 9
McCren, Jas. Gen. Manager ... 151
Metcalf in N. Y. Wm ... 45
Mexican Central R. R. Appointment ... 80
McGrath, resigned, Capt. Wallace ... 102
Muir's Salary, Traffic Supt ... 151
Minneapolis, Engineers Club, Election of Officers ... 55
Minor, John Gen. Man. Ore. Imp. Co ... 115
Morrison Elected F. R. A. S. Dr. J ... 9
Morison to investigate O. R. & N. Co. Geo. S ... 20
Morton Geo. Appointment ... 231
Moses, Supt. of Sewers, Boston, H. H ... 91

NEWTON, Col. John Appt. Chief of Eng. ... 115
Nichols Appointed Gen, Supt. A. M ... 20
North resigned, Ed. P ... 9

OFFICERS of Panama R. R ... 55
Otis Capt. Jas. died ... 162

PAGE, Frank dead ... 231
Patten, W. Baird Elected City Engineer ... 201
Peacock, Oscar H. Re-appointed ... 174
Pearsons, G. W. Kansas City ... 140
Petherham, Ch. Eng. J. W ... 20
Phelps, E. H. dead ... 151
Pugh, A. G. Asst. City Engineer ... 259, 272
Pullen and Surveyor Generalship of New Mexico, Clarence ... 20 55

RAND Drill Co. Removal ... 217
Rathburn, C. M. Appointed ... 245
Retirement of Canada Pacific Officials ... 201
Rhodes, D. H. Appointed ... 245
Rich apptd. Chief Engr. W. W ... 55
Ricker, Col. R. E ... 115
Robinson Promoted, A. A ... 115
Rogers, Presented a Purse, A. B ... 55
Ross of C. P. R. James ... 55
Rosser, Gen. Thos. A. for Nicaragua ... 115
R. R. Officers of N. Y. & Conn. Air Line 140
Rutherford's Gift to Columbia College L. M ... 20

SAGE, Appointed Gen. Supt. J. Y ... 9
Salaries of Cleveland Engineers ... 231
Scatchard, J. N. Buffalo, N. Y ... 142
Searles, W. H ... 245
Shepard, Appointed Supt. O. M ... 20
Shipman, Jas. L. died ... 127
Sherman, W. J ... 188
Smith, Dr. Angus ... 313
Smith Graham ... 272
Smith, Mrs. Wm. Sooy died ... 201
Somers, W. A. re-elected ... 140
Southerland, Lieut. W. H. H ... 259
Spaulding, Chas. E. died ... 30
Strauchan, Jesse R. Appointment ... 140
Strong, W. M. died ... 162
Swan, Chas. H. sailed for Europe ... 115
Swenie, Barrett, and Cregier of Chicago, 45

TEMPLE, Resigned, M. B ... 102
Thompson, Resigned, A. S ... 115
Tidd's Plans for Water Works, M. M ... 20
Todhunter, Isaac died ... 115
Trew, Appointed Eng. in charge of Niagara Bridge, A. R ... 55
Truscott, Geo. Buffalo, died ... 127
Tucker, Francis C. opened an office ... 127
Tucker, Jas. F. Resigned ... 217

VAN WINKLE E. B ... 316
Vermuele, C. C. Geological Survey of N. J ... 174
Villard, Henry ... 9, 18, 20, 288

WAGNER, Apptd. Supt. of Construction A. S ... 115
Wagner, Carl Von returned from Mexico ... 202
Waltz, Joseph re-elected ... 231
Watson, opens an Office, Walter ... 69
Welch, takes charge of Worthington Meter, S. A ... 69
Wellington, A. M ... 140
Western Society of Engineers, Election of Officers ... 75
Wheeler, Apptd. Asst. Engr. D. M ... 55
Weston, John B ... 314
Wheless, A. M. Supt. of Water-works ... 245
Whinery, Presented Silver Service, Maj. S ... 55
White, Appointed Professor Geo. H ... 30
Whiting, S. B ... 288
Willis, Henry Battle Creek ... 202
Wilson, Promoted, Wm. Hasell ... 80
Wilson, Alfred Visits New York ... 288
Woods, Dutton died ... 231
Worley, Joseph ... 272
Wright, Brig. Gen. H. G. retired ... 115
Wright, R. K. Panama ... 162



Petroleum and Biblical Salt ... 125
Petroleum Interests, American ... 275
Philadelphia Departments Consolidated. 30
Phosphorescent Light ... 247
Photography, Engineering (*Illustrated*) ... 294
Photo-Copying of Maps in France ... 320
Pile-Driving in Japan (*Illustrated*) ... 229
Pipes, Service ... 326
Plates, Test Pieces for Bars and ... 79
Plumbers Bill ... 130
Poetsch Method of Shaft Sinking by Freezing, The ... 282
Pollution of Streams ... 59
Powder, Brown ... 208
Powder, Rackarock Blasting ... 100, 152
Preserving Scenery at Niagara Falls ... 10
Prevention of Floods in Cincinnati, O ... 141
Problem in Compound Curves ... 129
Problem in Geometry ... 129, 152
Problem in Surveying ... 305
Process for Silvering Glass ... 187
Proposals for Dredging ... 144
Public Works of Buenos Ayres, The ... 151
Public Works in Congress ... 47
Public Works of Paris ... 273
Public Works of Philadelphia ... 214
Pump and Pipe Co., Evansville, Ind ... 118
Pumping Engines at Saratoga, The Holly Gaskill (*Illustrated*) ... 195
Engine for N. Chicago Rolling Mill Co ... 23
Engine, New Columbus, O ... 118
Engine, The Shield ... 105
Machinery, Economy in ... 220
Machinery, Greenville, Ills ... 118
Purification of Foul River ... 305
Pyramed, Who Built the Great ... 243

RACE Courses, Constructing ... 163, 176, 189, 232, 275, 289


## RAILROAD AND RAILROADS.


Accidents in England in 1883 ... 235
A Mountain ... 103
A Crooked Piece of ... 207
a failure, Sinaloa and Durango ... 221
and State Rights ... 235
appointments, Panama (*Personal*) ... 55
A Short The Nantucket ... 206
A. T. and S. Fe ... 206
Austrian ... 249
A 2 ft. Gauge ... 179
Brooklyn Elevated ... 7
Building in Wisconsin in 1884 ... 180
Building 50 Years Ago ... 117
Building in U. S. in 1881 ... 180
Canadian ... 221
Canadian Pacific ... 101, 221
Centering in St Paul and Minneapolis ... 12
Changes of Officers, Ontario and Western ... 102
Chi. Wis. and Northern ... 192
Commissioners of Conn. Report of the ... 54
Commissioners of Mass., Report of ... 24
Co. Curtailing Expenses, Mexico and Vera Cruz ... 83
Connotton (N. G.) ... 12
Co. Income of Penna ... 180
Co., Inter-Oceanic Ship ... 119, 138, 199, 206
Construction and Equipment of Narrow Gauge ... 123, 141
Construction in British Columbia C. P 63
Construction in 1883, Union Pacific ... 48
Construction in U. S ... 277
Contractors, Canadian Pacific ... 73
Contract for Cars, New York, West Shore and Buffalo ... 12
Contract, Wis. Central ... 179
Cost to the State of Kansas ... 12
Danchell's Electric ... 38
Damage against N. Y. Elevated ... 249
Des Moines and Dakota ... 191
Des Moines and St. Joseph ... 179
Double Tracking the Grand Trunk ... 143
Earnings, Penna ... 120
Employés in America ... 180
Employés must resign Public Office Reading ... 24
Employés, Prussian ... 179
Employés, Number and Pay of Central Pacific ... 60
Engineers on C. P. R. R. American ... 82
Expert Examination of the Toledo, Cincinnati and St. Louis ... 166
First Through train on Mexican Central ... 143
Fiftieth Anniversary of the Penna ... 207
Gauge changed, Virginia Midland ... 95
Govt. Aid to Canadian Pacific ... 48
Grading Pike's Peak ... 84
Harrisburg and Potomac ... 12
Huntingdon South Western ... 179
in Colo. The Union Pacific ... 48
Indiana ... 106
in hands of Receivers ... 179
Investments in the World ... 95
Iron Cross Ties ... 38
Land Grants, Forfeiture of ... 12
Loan, A Japanese ... 72
Loan, New York, West Shore and Buffalo ... 60
Louisville, Short Route Elevated ... 277
Meadville and Louisville ... 107
Mexican Central ... 132 166
Mileage of 1883, New ... 29
Mt. Vesuvius Wire ... 206

Narrow Gauge 284
New York, West Shore and Buffalo 12
New Vermont (N. G.) 191
Nicaragua, Oriental 275
Official Change, Mexican National 102
Officials' Death, Statistics of 250
Old Colony 235
Pacific and Great Eastern 263
Passenger Traffic N. Y. City 120
Pennsylvania's First 98
Projects, South American 306
Property, New Jersey's Investment in 24
Receiver for Newcastle and Northern 166
Receiver for New York and New England 12
Report for 1883, Michigan Southern 12
Report of Flint & Pere Marquette 154
Report of Pittsburg, Wheeling and Kentucky 166
Report of Mich. Central 249
Richmond and Chesapeake 179
Securities, Decline in 57
Signaling, New Departure in 306
Shops, Detroit, Lansing and Northern 155
Sold, Burlington and Ohio River 154
Statistics of 10th Census 120
State Management of Italian 48
Statistics of Canadian 179
Statistics, Missouri 292
Stocks Have Fallen, How 166
Co. Stock Canadian Pacific 132
St. Louis and San Francisco 12
Suit Decided 84
Survey, Outfit for a 70
Surveyors, Damage Done by 300
System, Magnitude of the Canadian Pacific 72
Through Indian Territory 206
Ties 180
Ties, Effect of Climate on 65
Ties in Germany, Iron (*Illustrated*) 111
Track Best in U. S., Boston and Albany 191
Travel, N. Y. Elevated 180
Traveling, Fast 249
The Gettysburg and Harrisburg 159
The Pennsylvania 207
Verdict against the International and Great Northern 96
Wrought-Iron Tube for Cable (*Illustr'd*) 332


## RAILROADS, NEW


A Soudan 277
American Midland 120
Atchison, Topeka and SantaFe 277
Augusta, Ga., and Gibson 235
Bangor and Portland 221
Bills passed by Va., Senate 36
Birmingham and Tennessee 250
Bluffton and Loganspoit 48
Bogota City 48
Boston Elevated 60, 83
Boston and Lowell 154
Boston and N. Y. Air Line 84
Broadway Arcade 143
Brooklyn Elevated 277
Brunswick, Ga., and Cape Sable, Fla. 95
Buffalo, N. Y. and Philadelphia 36
Building in India 166
Building in Pennsylvania 179
Burlington, Cedar Rapids and Northern 12
Canadian Pacific 36, 105 166
Central Nebraska 220
Charleston, Cumberland Gap and Chicago Air Line 48, 84
Charleston and Pittsburg 220
Chicago, Burlington and Quincy 143
Chicago and Kansas Central 152
Chicago and Norfolk Air Line 95
Chicago, Petersburg and Norfolk 220
Chippewa Falls to St. Paul 84
Cincinnati and St. Louis 72
Cincinnati, Van Wert and Michigan 249
Cleveland and Western 131, 143
Coalport and Cresson, Pa. 263
Columbus, Ft. Wayne and Western 264, 296 330
Columbus, Ft. Wayne and Chicago 329
Columbus and Memphis 329
Construction Co., and Southern R. R. 72
Construction Co., American 250
Cresson, Clearfield and N. Y. 306
Crookston and Southwestern 250
Delaware and Hudson 59
Delaware, Lackawanna and Western 180
Denver, McPherson and Wichita 235
Duluth Fargo and Black Hills 131
Duluth, N. Shore and Southwest 207
Eastern and Western Air Line 249
Eldorado, Newton and McPherson 277
Elmira, Cortland and Northern 131
Fitchburg 250 318 330
Florida Navigation Co., and 120
Franklin and Megantic, Me. 48, 278
Ft. Smith and Sabine Pass 131, 250
Gananoque, Perth and James Bay 95
Georgia 107
Grand Forks, Crookston and Lake Superior 48, 60, 166
Gravenhurst and Callender 12
Great Northern and Canada 155
Greencastle and Southern 292
Guatemalan 120, 155
Harlem River 12
Hartford and Harlem 12
Hempfield Extension of B. & O. 24, 36
Houston, E. and W. Texas 207
International 60
Interstate and Transfer Co. 12
Ills. Southern and Paducah 235
Iowa and Minnesota Northern 220
Java 106
Joliet, Ill. Aurora and Northern 235
Kansas City and Southern 250
Kansas City and Southwestern 306
Kansas City, Ark. and Ft. Smith 292
Kansas City Belt 107
Kansas City Des Moines and Northern 107
Kanawha Valley 95
La Crosse, Iowa and Southwestern 96
Lake Erie and Mississippi 24, 36
Lake Ontario Terminal 292
Lawrenceburg and Belleville 166
Leadville Extension of N. P. 36
Lexington and Utica (Mich.) 220
Lima and Columbus, O. 119
Lynchburg and Southwestern 95
Macon and Florida Air Line 48
Macksburg, Middleburg and Stafford (N. G.) 220
Maine Central 107
Manchester and Fitchburg 220
Macksburg and Louisville 235
McMinnville and Sparta 166
Mexican International 24
Middletown, Lebanon and Cincinnati 235
Milwaukee, L. Shore and Western 47
Minneapolis and Sault Ste. Marie 47, 107 120
Minn. Mille Lacs and Northern 208
Moline, R. I. and Southern 95
Montreal and European Short Line 249
Mt. Desert Is. Green Mt. 243
Mt. Vernon, N. H. 119
Mt. Vernon, Coshocton and Wheeling 221
Nanaimo and Esquimault 154
Nanticoke and Morgantown 207
Nebraska Central 179 318
New Florida (N. G.) 95
New Kentucky 107
New Northwest 207
New Orleans Elevated 48, 90
New River and Chambers Valley (Va.) 97
New York and Conn. Air Line 12, 48 60
New York Arcade 108, 250
New York Cable 207
New York, Danbury and Boston 48
New York, Norfolk and Charleston 155
New York, Phila. and Norfolk 120, 131
New York, Rock Island and Omaha 36
Nicaragua, New 150
N. T. & Q. 305
Northern Illinois 119, 131, 292
Northern Pacific 47, 72, 318
Norwood and Montreal 120, 131, 154
Notes, Southern 24
Ohio and Guyandotte 107
Ohio River and Lake Erie 132
Ontario and Pacific 24
Ontario and Quebec 221, 235, 318
Ottawa, Morrisburg and N. Y. 12
Pacific and Great Eastern 235, 306
Pacific, Minn. and Wis. 207
Panama 36
Penn. Schuylkill Valley 24
People's 207
Petersburg and Exeter 208
Philadelphia Cable 278
Philadelphia Elevated 24
Pikes Peak 217
Pine Bluff and Swan Lake 329
Pittsburg and Allegheny Central 24
Pittsburg, Knoxville and Beltzhoover 72
Pontiac and Pacific Junction 59
Projects, Canada 250
Quincy, Jacksonville and Eastern 107
Reading and Pottsville 120
Redfield, Bismarck and Northern 59
Richmond and Chesterfield 179
Richmond and Chesapeake 330
Russian Pacific 149, 292
Salem and Southwestern 95
Salina, Lincoln and Fremont 143
Seaboard, Penn. and Western 12, 107
Selma and Tennessee River 250
Shenandoah Valley 59
Ship Railway, A. Suez 154
Shore Line, Me. 48
Sioux City and Pacific 84
South Penn 108, 120, 166
Springfield and Northern 235
St. Croix and Chippewa Falls 154
St. Joe and Rio Grande 108
St. Louis, Ia. and Dak. 329
St. Louis and Kansas City Short Line 47
St. Louis, Belleville and Eastern 83
St. Louis Elevated 306
St. Louis, K. C. and Western 277
St. Paul, Brainerd and Northwestern 250
St. Paul and Eldorado 131
St. Paul and St. Croix 180
Sierra and Rocky Mountain 47, 107
South Bend and Kankakee Valley 60
Southwest, Ark. and Ind. Ty. 329
Spokane Falls and Couer d'Alene 143
Staten Is. Rapid Transit 143
Superior Short Line 83
Survey in Illinois, New 60
Tehuantepec Ship 12
Topeka Circle 36
Tunnel under St. Clair River at Port Huron 47
U. S. Cable Road and Sub Way 155
Venezuelan 306
Vincennes and Ohio River 235
Virginia and Western 221
Washington, Cincinnati and St. L. 207
Waterloo and Magog Extension 96
Waynesboro and Washington 206
Western Cable 131
Western North Carolina 277
West Virginia 98, 179
Wheeling and Lake Erie 143
Wichita, McPherson and Denver 36, 318
Winnipeg and Hudson's Bay 131
Wisconsin Central 108
Wis., Ia. and Neb. 220
Wyoming Southern 107
Yankton, Okobjo and Fort Buford 60
Yellowstone Nat'l Park 292
Zanesville, McConnellsville and Pomeroy 83
Railroading in America, Jas. M. Henry on 139
Railroading in South America 34
Rail Saw Wanted, A 304
Rail to Buenos Ayres, By 150
Rail to South America, By 226
Rainfall, Maximum Rates of (*Illustrated*) 268
Rainfall Statistics, Annual 130
Rainfall this Year, The 158
Raising and Moving Buildings in America (*Illustrated*) 62
Ramapo Improvement Co. The 18
Recrimination (*Illustrated*) 216
Reduction of Employés of Baldwin Locomotive Works 207
Registering Speed on Bridges 125
Report for 1883, Cambridge, Mass. 138
for 1883, Holyoke, Mass. 66
for 1883, New York Board of Public Works 126
N. Y. State Engineers' 6, 18
Providence, R. I. 32
Springfield, Mass. 15 126
of Board of Public Works, New Haven, Ct. Annual 190
of Buffalo Water Commissioners 59
of Cincinnati Board of Public Works 91
of City Engineer of Boston 231
of City Engineer of Fall River, Mass., Annual 189
of City Engineer of Omaha 247
of Kansas City for 1883 162
of the Coast and Geodetic survey for 1882 44
of the Engineer's Department District of Columbia 54
of the R. R. Commissioners of Conn. 54
of Troy, N. Y. Water Commissioners 234
Resignation of Gen. Winslow 84
Reservoirs in Limestone Countries 92
Reservoir in Ware and Goffstown, N. H. 142
Reservoir of Manchester, Eng. 153
Reservoir, Washington New 165
Review of the Industrial Interests of 1883 44
River, Closing the Mouth of Red 47
Rivers, Regulation of Western 92, 104
Roads and Road Making 85
Roads, County 101
Rules for Distance to and Cut or Fill at Slope Stake from Surface Slope 129
Rule for Gauging Casks 42
SALARIES of Pittsburg Engineers 312
Salt, Petroleum and Biblical 125
Salt Water and Gravel 315
Sanitary Benefit of Cincinnati Floods 206
Scales of Plans 188
Schemes for New Thames River Crossings 36
Screw Drivers, Attachment for 34
Sea, The Interior African (*Illustrated*) 146
Service Pipes 326


## SELECTED MISCELLANY.


ACCIDENTS in English Coal Mines 271
American Exhibition in London 111
An Aged "Corner Post" Tree 111
Arc de Trimophe 311
Area of the Principal Seas 125
Area of U. S. Total 215
Asbestos Rope 77
Asphaltic Wood Pavement, Copland 10
Australian Explorations 77
BELT on Saturn, New 149
Bessemer Steel Invention 229
Bismarck to Ft. Benton 285
Boiler Laws of 1881, Protest against the 89
CANADA'S Financial Credit 229
Canal, A Second Suez 101
Canal, Proposed Malayan 215
Canals of India 311
Capital invested in English Tramways 29
Cave and Cliff Cities 17
Cellars, Philadelphia City Hall 10
Chains, Two Large 149
Chinese Custom about Coffins 65
Cholera Germs in Calcutta 101
Commission, Mississippi River 89
Competition in Electricity 65
Conversion of Light into Electricity 45
Copper Production of U. S. for 1883 101
Cost of Promoting Co's. in England 10, 29
Cost of U. S. Capital 45
Crowded Condition of New York 229
DEEP Sea Soundings 111
Drainage, Farm 89
Draining the Roman Campagna 77
Dry Galvanic Battery 111
ECONOMY in Mining 53
Electric Lights Visible 80 Miles 161
Electric Watch, An 149
Enfield, N. H. Finances 149
Explosives, Tabulated Experiments with 215
Eyes Injured by Elevated R. R. 53
FIRST American Ship through Suez Canal 149
Fiftieth Anniversary of First Belgian Railway 149
Flood Rock Excavation Completed 111
Four Highest Points in New York State 10
Frozen Earth in Well Boring 215
Ft. Wayne Repudiates Standard Time 45
GAS from Limed Coal, Manufacture of 215
Gas from Sawdust 89
Gas Well, A great 161
Geo. Walter, Civil Engineer 161
Glass Floors 17
HENNEPIN Coal Bill Reported Favorably 65
Highways of England and Wales 29
Horse-cars on a European R. R. 17
Hottest Place on Record 111
House Building in London in 1882 111
House in New York, Narrowest 229
Illuminants, Facts Regarding 17
Incandescent Electric Lamp in Railway Cars 53
India Ink was Invented, When 29
Iowa's New Capitol 10
Iron and Steel Production in 1883 111
Iron, New Process for Melting 53
Irrigation in California 311
JAPANESE Railways and Telegraphs 77
KINKS in Telegraph Cables, To Prevent 215
Krupp's Works at Essen 111
LABOR Statistics, Illinois 125
Lagang Bridge, China 45
Largest City in Japan 125
Largest County in U. S. 285
Largest Fence in the World 45
Lakes, Minnesota 271
Leather Car Wheels 17
Lighthouse and Buoys, U. S. 229
MAGNETIC Iron Mountain 29
Map of Russia, New 89
Measuring heights by Shadows 285
Mexican Statistics 285
Mining and Ventilating Laws 65
Mt. Everest not the Highest Himalayan 149
M. Yvon Villarceau 17
NEW Metal from Slag 125
Nitrogen, Solidification of 89
OVERSTOCKED State of Architects' Profession 10
PARIS Telephone Wires 17
Patent Law Amendment 77
Pavements, Earthen Tile 271
Peterborough Cathedral Frauds 285
Plowing by Steam 311
Pneumatic Tube, Longest 271
Poor of London, Cost of Sheltering the 215
Population of Belgium 149
Progress of Electric Lighting 45
Pyramid of Cheops 10
RAILROAD Investment in U. S., Total 271
Railroads, Japanese 271
Railroads, Lynn and Boston Horse 149
Railway Plant 40 years ago 65
Rivers and Canals of France 215
Rise and Fall of the Great Lakes 10
Roof Trusses of European Churches 17
Rubicon Defined, The 65
Russian Population Statistics 161
SALE of So. Pac. R. R. Co. Camels 45
Salt Ballasted Railroad 29
Sanitary Condition of Montreal 161
Sewers of Paris 271
Ship Canal bet. Baltic Sea and German Ocean 45
Snow in New Hampshire 215
South African Irrigation Work 45
South American Woods for Engineering 10
South Boston Iron Works 125
Slates, The Trade in 53
St. Johnsbury, Vt., Official Report for 1883 101
Stone, An Oregon Building 215
Straw and Wood Pulp 89
Suakim, The Name of 149
Survey of Jordan Valley 271
Survey of Palestine 149
Survey of Texas Pacific R. R. Incorrect 101
TELEPHONES in European Cities 92
The Dry Year in California 45
"The Heathen Chinee" 77
The Largest Telegraph Corporation 65
The Locomotive "Arabian" 17
Time, Present Statistics of Standard 101
Tin Discovered in N. C. 53
Toronto's Incorporation, 50th Anniversary 125
Topographical Survey of Mass. 229
Topographical Survey of Pittsfield Co., Mass. 53
Tramways, French 271
UNDERGROUND Telegraph Cables in London 10
Unemployed of Europe 77
Urban Mortality of England 101
VANDERBILT'S Income Compared 77
Vanderbilt's Treasure Vault 311
Ventilation of St. Gothard Tunnel 101
Verdict for the builders 89
Vermont's Tax Law a failure 101
WATER Pipes against Rupture, Protection 77
Water-Proof Boots and Shoes 45
Water-Proofing Clothing 101
Water Surface of Dakota 285
Weather observations for 54 years 125
Well Boring, Uncertainties of 271
Why the Chinese Oppose Railways 161
Whispering Gallery, Greatest 311
Wind on Mercury, Effect of 29
Sewage Discharge, Metropolitan 101
Sewage Disposal 11, 72, 87, 178, 228, 221 297
Sewer Connections, Clay vs. Iron Pipe for 297
Sewer, Deptford Storm Overflow 316
Sewer Gas, Suffocated by 59
Sewer Traps in Washington, Cleaning 221
Sewerage, Augusta, Ga. 105
Boston Improved 7, 11, 23, 43, 47, 83, 106
Brockton, Mass. 178
Brooklyn's Water Supply and 18
Chicago, Ill. 23, 143
Columbus, O. 8
Coney Island 72
Fort Scott Mo. 56
Freeport, Ills. 131
Geneva, N. Y. 157
Kansas City, On the 193
Kansas City, The 81, 82, 209, 223, 257
Keene, N. H. The (*Illustrated*) 8
Little Falls, N. Y. 106
Lynn, Mass. 206
Memphis 10, 46, 260
Newport, R. I. 23, 178
Norfolk, Va. The Water-supply and 126
Old Orchard Beach 157
Petersburg, Va. 143
Portland, Ore. 179
Question, The London 139
San Antonio, Tex. 23
Stamford, Conn. 96
Syphon, Cost of Milwaukee 61
Toronto, Can. 83
Waltham, Mass. 143
Washington D. C. 248
Wilmington, Del. 102
vs. Waring Patents, Separate 236, 242, 244
Youngstown, O. 166
Sewers in Cleveland, O. 132
Sewers Comparative Economy of Combined and Separate 256
Sewers Lake View, Ills. Cost of 35
Sewers Salem, Mass. 132
Sewers Schenectady, N. Y. 132
Shaft-sinking by Freezing, The Poetsch Method 282
Shaft-sinking through Quicksand 57
Singular Phenomenon in Sand, A 65
Smoke Products 275
South American News 63, 70
Some Last Words 8
Special Appliances for Fire Protection 203
Specifications, Quaker Bridge Dam 171
Specifications, Standard Bridge 127
Speed of Trains, The 153
Stand Pipes 95
Standard of Weight and Height 319
Steam Engine, New Horizontal 150
Pump Works, Dean Bros. 205
Road Roller for Kansas City 59
vs. Water Power 11
Users' Association, Manchester 100
Vessels, Board of Supervising Inspectors of 71
Steel Permanent Way, Iron and 283
Steel, Strength and Elasticity of Structural 245
Stones of Chicago, The Building 1
Stop-Cock that will Drain Valve 65
Street Improvement in 1884, Chicago 59
Street Paving in Kansas City 78, 88
Street Railways in Great Britain, Length of 289
Strength and Elasticity of Structural Steel 245
Suit by a Minneapolis Contractor 35

Suits growing out of the Blackstone River Disaster ... 142
Suit of City of Pittsburg vs. Hartupee ... 105
Suit of Eliery vs. Crawford ... 83
Suppression Policy of American Engineers, The ... 244
Survey, Cost of ... 107
for 1882, Report of the Coast and Geodetic ... 44
for 1883, N. Y. State ... 114
of Central American Coast ... 36
of Mass. Topographical ... 271
of Passaic River ... 220
Progress of the U. S. Geological ... 4
U. S. Coast and Geodetic ... 312, 317
Surveyors' Associations ... 300
Surveyors' Camp Fire Yarns ... 296
Surveyors, Damage Done by R. R. ... 300
Surveyor in 1671, The ... 19
Surveyors of To-day, The Land ... 304
Swamp, A Trumbull Co ... 298
Switches, Frogs and ... 224, 247
Switches, Split and Steel ... 154

TABLES, Metric Conversion ... 42, 46
Tamping with Plaster of Paris ... 285
Tapping Machines ... 55, 105, 131
Tehuantepec Ship Railway, The ... 134, 159
Telegraph and Cable Co., Postal ... 12
Telegraph Cable between Saigon and Tonquin, Submarine ... 47
Telegraph Cable, Kerite ... 19
Telegraph Line, Minneapolis and Madison ... 208
Telegraphs, Underground ... 313
Tempering of Bronze, The ... 97
Ten Years of an Engineering Journal ... 186
Test Pieces for Bars and Plates ... 97
Texas Capitol, The ... 153
Then and Now ... 61
Ties, Effect of Climate on Railroad ... 65
Ties in Germany, Iron Railway (*Illustrated*) ... 111
Ties on Railroads, Iron Cross ... 38
Timber Sections, How to Preserve ... 149
Timber Trestle at Grand Rapids, Temporary ... 38
Topographical Survey of Mass ... 271
Topographer, The ... 46, 58, 68
Towage by Endless Chains ... 17
Trade and the Winter ... 11
Traveller Used in the Erection of the Niagara Cantilever Bridge, The (*Illustrated*) ... 98
Trestles, High Wooden ... 116
Trestle, The Largest ... 250
Truck, Terhune, Automatic ... 276
Tunnel and Compressed Air Plant, The Washington Aqueduct (*Illustrated*) ... 75
Bozeman ... 72
Colo., Bridgeport ... 107
Completion of Bozeman ... 24
Diamond Drills and the Ventilation of Long ... 216
Disaster, Krupp's ... 292
Drills of the Arlberg (*Illustrated*) ... 25, 37
Finished, Hodges Pass ... 131
Georgetown, Col ... 119
Great St. Bernard ... 285
Gould's ... 24
Hyde Park, Ill., Water-works ... 130
Providence, R. I. Contract for College Hill ... 36
Lynn Water-works ... 142
Progress, Severn ... 119
The Mersey ... 36, 79
The Simplon ... 110
The South Penn ... 24, 58
The Welbeck ... 285
Through the Pyrenees ... 54
Washington Aqueduct ... 23
Tunneling Broadway, N. Y ... 54
Tunneling the Sierras ... 166
Tunneling Under Difficulties ... 57

UNION is Strength, In ... 232
University of Missouri, Commencement ... 301

VIADUCTS and Trestles, High Wooden ... 82
Viaduct, Keying in the Arch of the Garabit (*Illustrated*) ... 268
Value of Leadville Products ... 36


## WATER.


Water and Drainage in Mexico ... 276
Against Whiskey and ... 153
at Greeley, Colo. Boring for ... 154
Bazalgette's Statistical Information about ... 72
Board's Inspection of Storage Basins Boston ... 234
Board of Holyoke, Mass. Report of ... 234
Board, Salem, Mass ... 142
Board, Clinton, Mass ... 118
Bonds, Milwaukee ... 105
Bonds, St. Paul ... 165, 206
Commisioners, of New Brunswick, N. J. 11th Annual Report of ... 178
Commissioners Report of Poughkeepsie, N. Y ... 234
Commissioners of Troy, N. Y. Report of ... 234
Company, Bradford, Mass ... 83
Carrolton ... 177
Crystal ... 219
Freeport, Ill., Resignation of Supt ... 131
Housatonic ... 131
Hyde Park, Mass ... 94, 104, 178 205
Incorporated, Dayton and Bellevue, Ky ... 94
Lancaster, Mass ... 84, 104
London, Eng ... 130
Mamoreneck ... 59
Pottsville, Pa. Girard ... 104
Queens Co. L. I ... 206
Sunderland, Mass ... 83, 104
Waco, Tex ... 219
Debt, Clinton, Mass ... 104
Debt, Malden, Mass ... 94
Department, The Philadelphia ... 258
Filter at Kingston Ont ... 105
Filtration of ... 322
for Irrigation in Colorado ... 118, 205
Gauge, New ... 154
from Jersey City, A Project to supply Lower N. Y. with ... 54 78
Impurity of Schuykill ... 18
in Mass, Selling ... 118
Line, Underg ound ... 175
Mains, Brockton, Mass ... 118
Mains, Philadelphia, Pa ... 94, 118
Manistee, Mich ... 177
Measuring in Philada, Pa ... 118
Meter Legislation in Mass ... 153
Meter Patent, A New ... 69
Meter Question, The ... 142
Meter Tests in St. Joe, Mo ... 177
Meters ... 83
Meters at Lock Haven, Pa ... 71
Meters in Boston ... 177, 178
Meters in New York ... 123
Meters in Mass ... 105
of Penobscott River, Analysis of ... 142
Pipe at Boston, Bids for Cast Iron ... 105
Pipe, Chicago, Ill ... 263
Pipe, Concrete ... 118, 267
Pipe, Conn. Patent ... 105
Pipe Contract Let ... 154
Pipes, Galvanized Iron ... 234
Pipes, Greenwich Conn. to Portchester, N. Y ... 23
Pipe in 1883, Extension of Malden, Mass ... 23
Pipe, Service Pipe for ... 105
Pressure Gauge ... 46
Power Co. Biddefordand Saco, Me ... 177
Power Co. Little Falls, Minn ... 106
Power in Manitoba ... 11
Power of Merrimack River ... 118
Powers of the U. S. Principal ... 11
Power, Olcott Falls ... 165
Power, Piqua, O ... 106
Pure ... 177
Rates, Baltimore ... 220
Rates, Minneapolis ... 165
Rates, Taunton, Mass ... 219
Report, Lambertville, N. Y ... 153
Report, Plymouth, Mass ... 153
Supply and Waste in Cities ... 315
Taker, The First London ... 242
Tunnel at Lynn, Mass ... 35
Tunnel, Hyde Park, Ill ... 263
Useful Information About ... 291
Waste in St. Louis, Mo ... 130
Waste of ... 234, 315
Waste of Croton ... 306


## WATER SUPPLY.


Abington, Mass ... 94
Albany, N. Y ... 118
and Sewerage, Brooklyn's ... 18
and Sewerage of Norfolk, Va. The ... 126
Atlanta, Ga ... 165
Baltimore ... 235, 256
Beverly, Mass ... 154
Big Springs, Tex ... 248
Boston ... 234
Brooklyn, N. Y ... 105, 291
Co. Watertown, Mass ... 291
Corsicana, Tex ... 219
Danforth, N. Y ... 191
Dallas, Tex ... 95
Filtering the ... 154
for Clifton, O ... 234
Fredericksburg, Va ... 94
N. Y. High Service ... 102
Salem, Mass. Additional ... 142
Utica, N. Y ... 32
Hackensack ... 263
in Mass, Legislature ... 59, 71
Jersey City ... 227
Kensington, Pa ... 276
London, Eng ... 165 214
Long Branch ... 177
Marblehead, Mass ... 118
Metropolitan (*Illustrated*) ... 169, 297
Middleboro, Mass ... 276
Morristown, N. J., Additional ... 142
New York's New ... 130
Kalamazoo ... 68
Lansing, Mich ... 291
of N. J., Report of Commissioners of the State ... 177
New York City ... 178, 305
Pekin, Ill ... 248
Philadelphia ... 138, 191, 248
Rural (*Illustrated*) ... 121, 160, 226, 240
Taunton, Mass ... 118
Waco, Tex ... 248
Waltham, Mass ... 104
Winthrop, Mass ... 177


## WATER-WORKS.


Albuquerque, N. M ... 318
Annual Report of Worcester, Mass ... 177
Atlantic, Ia ... 291
Bath, Me ... 142, 248
Bay City ... 91
Bellefontaine, Ohio ... 130
Berryville, Va ... 105, 234
Bismarck ... 118
Bids, Irvington, N. Y ... 70
Binghamton, N. Y ... 206
Blue Island, Ill ... 305
Bonds, Boston ... 94
Bonds, Hamilton, O ... 94
Bradford, Pa ... 94
Brookline, Mass ... 318
Brooklyn ... 206
Cairo, Mich ... 305
Cambridge Mass ... 262
Centreville, Md ... 329
Charlottesville, Va ... 153, 178
Clay Center, Kan ... 35
Cleburne, Tex ... 248, 305
Cleveland, O ... 218
Clinton, Mass ... 83
Clinton, N. Y ... 329
Clyde, O ... 177
Contracts, Boston ... 153
Contracts, Girard Trust ... 153
Contract for Canandaigua, N. Y ... 47
Contract, Hudson, Mass ... 154
Contract Let, St. Paul ... 165
Colorado, Tex ... 276
Committee of Joliet, Ill ... 94
Connellsville, Pa ... 11
Cornwall, Can ... 142
Corsicana, Tex ... 165
Cortlandt, N. Y ... 118
Covington, Ky ... 263
Dallas, Tex ... 191
Danville, Ill ... 191
Del Rio, Tex ... 3.9
Description of Providence, R. I ... 142
Dobb's Ferry, N. Y ... 59, 165
Fairfield, Ia ... 276
for Calais and St. Stephen, N. B ... 71
for Lawrence, Kan. No ... 177
for 1883, Receipts of Chicago ... 23
Fredericksburg, Va ... 83
Franklin, Mass ... 130
Fulton, N. Y ... 118
Gloversville, N. Y ... 262
Gonzales, Tex ... 262
Grand Forks, Dak ... 154
Election of Officers of Columbus, Ga ... 94
Elkhart, Ind ... 219
Extension, Cardiff ... 177
Glens Falls, N. Y ... 317
Hopkinsville, Ky ... 105
Improvements, Cleveland ... 131
Jermyn, Pa ... 317
Jackson, Mich ... 306
Jerseyville, Ill ... 191
Kansas City ... 118, 291
Lewiston Me ... 142
Lexington, Ky ... 248
Lexington, Mo ... 191
Lincoln, Ill ... 105
Lorain, Mass ... 118
Lorain, O ... 318
Maintenance of ... 291
Menominee, Mich ... 291
Minneapolis ... 206
Moline, Ill ... 23
Mt. Vernon, N. Y ... 153
Nahant ... 59, 71, 142, 154
New Field's for ... 318
New Mass ... 141, 234
Newton, Kan ... 35, 142
Niagara Falls ... 35
Odebolt, Ia ... 276
Omaha, Neb ... 219
Orange, Mass ... 83, 131
Paola, Kan ... 276
Peabody, Mass ... 130
Penn Yan, N. Y ... 219
Pensacola, Fla ... 329
Pittsburg, Kan ... 154
Plainville, Conn ... 276
Quarrel, Springfield, Mo ... 83
Red Bank, N. J ... 142, 262
Richmond, Ind ... 219
Russian ... 329
Rust-Owens Lumber Co. Drummond Wis ... 248
Sac City, Ia ... 165
Salem, Ind ... 177
Salem Mass ... 229
Sandwich, Ills ... 67, 83
Sauk Centre, Minn ... 205, 215
Saratoga ... 118
San Angelo, Tex ... 329
Sedalia, Mo ... 119
Silver City, Ia ... 308
Sioux Falls, Dak ... 234
Sparta, Tenn ... 317
Springfield, Ill ... 219
Staunton, Va ... 248
Sandwich Ills ... 67
St. Cloud, Minn ... 78
St. Paul, Minn ... 142
Supt. Wyandotte, Kan ... 234
Tampico, Mex ... 248
Taunton, Mass ... 66
Test of Brainerd, Minn ... 105
Test of Council Bluffs, Ia ... 47, 94 105
Test of Quincy Mass ... 105
Tunnel, Hyde Park, Ills ... 130, 306
Tunnel, Lynn, Mass ... 94, 78
Valves for Buffalo, N. Y ... 142
Victoria, Tex ... 78, 291, 305
Wahpeton, Dak ... 154
Waltham Mass ... 262
Washington D. C ... 4
Watertown, Mass ... 206, 219
Wellsville, N. Y ... 11
Wyandotte, Kan ... 118
Well, How to Line a ... 298
Westinghouse Air Brake Patents in Court ... 63
Wire Gauge, Imperial Standard ... 100
Wood Preserving ... 129
Wrought-iron Tube for Cable Railways ... 322
Wyckoff Pipe Co ... 291


## WATER WORKS, HISTORY AND STATISTICS OF AMERICAN


Alma, Mich ... 247
Appleton, Wis ... 117
Archbald, Pa ... 93
Athens Asylum, O ... 130
Atlantic, Ia ... 164
Austin, Tex ... 191
Berthier, Que ... 142
Birdsboro, Pa ... 93
Brazil, Ind ... 94
Brockville, Ont ... 276
Brookville, Pa ... 262
Boonville, Mo ... 276
Bucyrus, O ... 276
Canton, O ... 262
Cheboygan, Mich ... 219
Chicopee Falls, Mass ... 247
Clarion, Pa ... 130
Columbus, Ga ... 290
Corsicana, Tex ... 329
Cote St. Antoine, Que ... 191
Danville, Ills ... 247
Duluth, Minn ... 306
Edmore, Mich ... 153
Fairbault, Minn ... 317
Farmington, N. H ... 328
Fayetteville, N. C ... 153
Fort Collins, Colo ... 248
Fredrickton, N. B ... 45
Fryeburg, Me ... 328
Galesburg, Ills ... 153
Gardner, Mass ... 233
Gorham, N. H ... 164
Hagerstown, Md ... 94
Hallowell, Me ... 117
Havre de Grace, Md ... 233
Jamesburg, Reform School, N. J ... 164
Kingston, N. Y ... 233
La Porte, Ind ... 104
Lewisburg, Pa ... 290
Longueuil, Que ... 94
Lyons, Mich ... 45
Marlborough, Mass ... 1
Maysville, Ky ... 289
Mechanicburg, Pa ... 104
Michigan City, Ind ... 317
Modesto, Cal ... 317
Mount Morris, N. Y ... 176
Napa, Cal ... 233
New Bethlehem, Pa ... 205
Norwalk, Conn ... 21
Olean, N. Y ... 205
Olympic, W. T ... 164
Orange, N. J ... 45
Parker City, Pa ... 290
Port Hope, Ont ... 247
Randolph, N. Y ... 290
Reno, Nev ... 305
San Buena Ventura, Cal ... 142
Sandwich, Ills ... 262
St. Cunegonde, Que ... 176
St. Gabriel, Que ... 191
St. Henri, Que ... 191
St. Johnsville, N. Y ... 117
Stoneham and Wakefield, Mass ... 317
Stratford, Ont ... 118
Turner's Falls, Mass ... 290
Unadilla, N. Y ... 164
Westminister, Md ... 247
Woodstock, Ont ... 205
Whitesboro, N. Y ... 104
Winnipeg, Man ... 94
Yarmouth, N. S ... 205